



## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 25

[Docket No. FAA-2017-1141; Special Conditions No. 25-710A-SC]

**Special Conditions:** Dassault Aviation Model Falcon 6X Airplanes; Non-Rechargeable Lithium-Ion Battery Installations.

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions, amendment.

**SUMMARY:** These amended special conditions are issued for non-rechargeable lithium-ion battery installations on the Dassault Aviation (Dassault) Model Falcon 6X airplane. Non-rechargeable lithium-ion batteries are a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport-category airplanes. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** This action is effective on Dassault on [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].

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## **SUPPLEMENTARY INFORMATION**

### **Background**

On July 1, 2012, Dassault applied for special conditions for non-rechargeable lithium-ion batteries installed in the Model Falcon 5X airplane. Special conditions were issued for that design on January 16, 2018 (83 FR 2032). However, Dassault has decided not to release an airplane under the model designation Falcon 5X, instead choosing to change that model designation to Falcon 6X.

In February of 2018, due to engine supplier issues, Dassault extended the type certificate application date for its Model Falcon 5X airplane under new Model Falcon 6X. This amendment to the original special conditions reflects the model-name change. This airplane is a twin-engine business jet with seating for 19 passengers and a maximum takeoff weight of 77,460 pounds. The Dassault Model Falcon 6X airplane design remains unchanged from the Model Falcon 5X in all material respects other than different engines.

The FAA is issuing these special conditions for non-rechargeable lithium-ion battery installations on the Dassault Model Falcon 6X airplane. The FAA's design standards in title 14, Code of Federal Regulations (14 CFR) part 25 are inadequate for addressing an airplane with non-rechargeable lithium-ion batteries.

### **Type Certification Basis**

Under the provisions of 14 CFR 21.17, Dassault must show that the Model Falcon 6X airplane meets the applicable provisions of part 25, as amended by Amendments 25-1 through 25-146.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Dassault Model Falcon 6X airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the airplane model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Dassault Model Falcon 6X airplane must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.17.

### **Novel or Unusual Design Feature**

The Dassault Model Falcon 6X airplane will incorporate the following novel or unusual design feature: Installation of non-rechargeable lithium-ion batteries.

For the purpose of these special conditions, the FAA refers to a battery and battery system as a battery. A battery system consists of the battery and any protective, monitoring, and alerting circuitry or hardware inside or outside of the battery. It also includes vents (where necessary) and packaging.

### **Discussion**

The FAA derived the current regulations governing installation of batteries in transport-category airplanes from Civil Air Regulations (CAR) 4b.625(d) as part of the recodification of CAR 4b that established 14 CFR part 25 in February 1965. This recodification basically reworded the CAR 4b battery requirements, which are currently in § 25.1353(b)(1) through (4). Non-rechargeable lithium-ion batteries are novel and unusual with respect to the state of technology considered when these requirements were codified. Non-rechargeable lithium-ion batteries introduce higher energy levels into airplane systems through new chemical compositions in various battery cell sizes and construction. Interconnection of these cells in

battery packs introduce failure modes that require unique design considerations, such as provisions for thermal management.

In January 2013, two independent events involving rechargeable lithium-ion batteries revealed unanticipated failure modes. A National Transportation Safety Board (NTSB) letter to the FAA, dated May 22, 2014, which is available at <https://www.nts.gov, filename A-14-032-036.pdf>, describes these events.

On July 12, 2013, an event involving a non-rechargeable lithium-ion battery in an emergency-locator transmitter installation demonstrated unanticipated failure modes. The United Kingdom's Air Accidents Investigation Branch Bulletin S5/2013 describes this event. These events involving rechargeable and non-rechargeable lithium-ion batteries prompted the FAA to initiate a broad evaluation of these energy-storage technologies.

On April 22, 2016, the FAA published special conditions no. 25-612-SC, in the *Federal Register* (81 FR 23573), applicable to Gulfstream Aerospace Corporation for the Model GVI airplane. Those were the first special conditions the FAA issued for non-rechargeable lithium-ion battery installations. In that document, the FAA explained its decision to make those special conditions effective on April 22, 2017, one year after publication in the *Federal Register*. In those special conditions, the FAA stated its intention to apply non-rechargeable lithium-ion battery special conditions to design changes on other airplane makes and models applied for after this same date.

Special condition no. 1 of these special conditions requires that each individual cell within a non-rechargeable lithium-ion battery be designed to maintain safe temperatures and pressures. Special condition no. 2 addresses these same issues but for the entire battery. Special condition no. 2 requires the battery be designed to prevent propagation of a thermal event, such as self-sustained, uncontrollable increases in temperature or pressure from one cell to adjacent cells.

Special condition nos. 1 and 2 are intended to ensure that the non-rechargeable lithium-ion battery and its cells are designed to eliminate the potential for uncontrollable failures. However, a certain number of failures will occur due to various factors beyond the control of the battery designer. Therefore, other special conditions are intended to protect the airplane and its occupants if failure occurs.

Special conditions 3, 7, and 8 are self-explanatory.

Special condition no. 4 makes it clear that the flammable-fluid fire-protection requirements of § 25.863 apply to non-rechargeable lithium-ion battery installations. Section 25.863 is applicable to areas of the airplane that could be exposed to flammable-fluid leakage from airplane systems. Non-rechargeable lithium-ion batteries contain an electrolyte that is a flammable fluid.

Special condition no. 5 requires that each non-rechargeable lithium-ion battery installation not damage surrounding structure or adjacent systems, equipment, or electrical wiring from corrosive fluids or gases that may escape in such a way as to cause a major or more severe failure condition.

While special condition no. 5 addresses corrosive fluids and gases, special condition no. 6 addresses heat. Special condition no. 6 requires that each non-rechargeable lithium-ion battery installation have provisions to prevent any hazardous effect on airplane structure or systems caused by the maximum amount of heat the battery installation can generate due to any failure of it or its individual cells. The means of meeting special conditions nos. 5 and 6 may be the same, but the requirements are independent and address different hazards.

These special conditions apply to all non-rechargeable lithium-ion battery installations in lieu of § 25.1353(b)(1) through (4) at Amendment 25-123. Sections 25.1353(b)(1) through (4) at Amendment 25-123 remain in effect for other battery installations.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

### **Discussion of Comments**

The FAA issued Final Special Conditions, Request for Comment Special Conditions No. 25-710-SC for the Dassault Model Falcon 5X airplane, which was published in the *Federal Register* on January 16, 2018 (83 FR 2032). No comments were received, and the special conditions are adopted as proposed, with amendments.

### **Applicability**

These special conditions are applicable to the Dassault Model Falcon 6X airplane. Should Dassault apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, these special conditions would apply to that model as well.

These special conditions are only applicable to design changes applied for after the effective date.

These special conditions are not applicable to changes to previously certified non-rechargeable lithium-ion battery installations where the only change is either cosmetic or to relocate the installation to improve the safety of the airplane and occupants. Previously certified non-rechargeable lithium-ion battery installations, as used in this paragraph, are those installations approved for certification projects applied for on or before the effective date of these special conditions. A cosmetic change is a change in appearance only, and does not change any function or safety characteristic of the battery installation. These special conditions also are not applicable to unchanged, previously certified non-rechargeable lithium-ion battery installations that are affected by a change in a manner that improves the safety of its installation. The FAA determined that these exclusions are in the public interest because the need to meet all of the special conditions might otherwise deter these design changes that improve safety.

## **Conclusion**

This action affects only a certain novel or unusual design feature on one model of airplane. It is not a rule of general applicability.

## **List of Subjects in 14 CFR Part 25**

Aircraft, Aviation safety, Reporting and record keeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

## **The Special Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for the Dassault Aviation Model Falcon 6X airplane.

## **Non-Rechargeable Lithium-Ion Battery Installations**

In lieu of § 25.1353(b)(1) through (4) at Amendment 25-123, each non-rechargeable lithium-ion battery installation must:

1. Be designed to maintain safe cell temperatures and pressures under all foreseeable operating conditions to prevent fire and explosion.
2. Be designed to prevent the occurrence of self-sustaining, uncontrollable increases in temperature or pressure.
3. Not emit explosive or toxic gases, either in normal operation or as a result of its failure, that may accumulate in hazardous quantities within the airplane.
4. Meet the requirements of § 25.863.
5. Not damage surrounding structure or adjacent systems, equipment, or electrical wiring from corrosive fluids or gases that may escape in such a way as to cause a major or more severe failure condition.

6. Have provisions to prevent any hazardous effect on airplane structure or systems caused by the maximum amount of heat it can generate due to any failure of it or its individual cells.
7. Have a failure-sensing-and-warning system to alert the flightcrew if its failure affects safe operation of the airplane.
8. Have a means for the flightcrew or maintenance personnel to determine the battery charge state if the battery's function is required for safe operation of the airplane.

**Note:** A battery system consists of the battery and any protective, monitoring, and alerting circuitry or hardware inside or outside of the battery. It also includes vents (where necessary) and packaging. For the purpose of these special conditions, a “battery” and “battery system” are referred to as a battery.

Issued in Kansas City, Missouri, on March 3, 2022.

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